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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/079,254	02/20/2002	Eric Prim	2103-00100	7239
23505	7590	04/21/2005	EXAMINER	
CONLEY ROSE, P.C. P. O. BOX 3267 HOUSTON, TX 77253-3267			LEUNG, RICHARD L	
			ART UNIT	PAPER NUMBER
			3744	

DATE MAILED: 04/21/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

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<b>Office Action Summary</b>	<b>Application No.</b> 10/079,254	<b>Applicant(s)</b> PRIM, ERIC	
	<b>Examiner</b> Richard L. Leung	<b>Art Unit</b> 3744	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 20 February 2002.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-27 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-13, 15-18 and 20-27 is/are rejected.
- 7) ☒ Claim(s) 14 and 19 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 20 February 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>5-23-03</u> . | 6) <input type="checkbox"/> Other: _____  |

**DETAILED ACTION**

***Claim Rejections - 35 USC § 112***

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claims 1-7 and 21-27 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. Both independent claims 1 and 21 require a distillation column configured to produce an overhead vapor stream and an overhead vapor product. This is not enabled by the specification. It is understood from the written description and the figures that the distillation column of the present invention produces only the overhead vapor stream but does not produce the overhead vapor product. The overhead vapor product is clearly produced from the overhead vapor stream by the overhead drum, and only after the overhead vapor stream is condensed by the feed-overhead heat exchanger. Appropriate correction is required to overcome this rejection.

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Alternatively, claims 1-7 and 21-27 are rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential elements and for omitting essential structural cooperative relationships of elements, such omission amounting to a

gap between the elements and the necessary structural connections. See MPEP § 2172.01. The omitted elements are: the overhead drum and how the overhead drum is connected to the distillation column and first heat exchanger to produce the claimed overhead vapor stream and overhead vapor product. Both independent claims 1 and 21 require a distillation column configured to produce an overhead vapor stream and an overhead vapor product. However it is understood from the written description and the figures that the distillation column of the present invention produces only the overhead vapor stream but does not produce the overhead vapor product. The overhead vapor product is clearly produced from the overhead vapor stream by the overhead drum, and only after the overhead vapor stream is condensed by the feed-overhead heat exchanger. These elements are considered essential to the invention and should be included in the claims.

***Claim Rejections - 35 USC § 102***

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claims 15-17 are rejected under 35 U.S.C. 102(b) as being anticipated by US 5359856 (Rhoades et al.). Rhoades et al. disclose a process for recovering ethane and heavier components from liquefied natural gas comprising the steps of preheating said liquefied natural gas in heat exchanger 21 (column 3, lines 14-15), fractioning said liquefied natural gas in separator 25 into a overhead vapor/methane-rich product stream

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4 and an ethane-rich product stream 5 (see Table II), compressing said overhead vapor/methane-rich product in a compressor 29 (column 3, lines 29-30), and condensing said overhead vapor/methane-rich product in heat exchanger 21 through heat exchange with the liquefied natural gas (column 3, lines 9-11 and lines 59-65).

7. Claims 21, 23, 24 and 27 are rejected under 35 U.S.C. 102(b) as being anticipated by US 3446029 (Grgurich et al.). Grgurich et al. disclose a method for preheating liquefied natural gas for feed to a distillation column 56, wherein said distillation column 56 produces an overhead vapor 70, an overhead vapor product 92, and a bottoms product 62, the method comprising the steps of exchanging heat from said overhead vapor 70 with said liquefied natural gas in a heat exchanger 12 and exchanging heat from said overhead vapor product 92 with said liquefied natural gas in a heat exchanger 8. It is further disclosed that said overhead vapor product 92 is condensed since it exits heat exchanger 8 as a liquid (column 4, lines 69-70), that a portion of said overhead vapor 70 is condensed (column 4, line 60-65), and that said condensed overhead vapor product 92 is pumped by a pump 94 (column 4, line 69-71).

***Claim Rejections - 35 USC § 103***

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

9. Claims 1-3 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 2952984 (Marshall, Jr.) in view of US 5359856 (Rhoades et al.). Marshall, Jr. discloses

a system for processing a liquefied natural gas feed 10 comprising a distillation column (tower) 16 configured to produce an overhead vapor stream 30 and an overhead vapor product 36, a first heat exchanger 18 configured to exchange heat between said overhead vapor stream 30 of said column 16 and said liquefied natural gas feed 14, and a second heat exchanger 20 configured to exchange heat between said first heated liquefied natural gas feed and a heating medium 48. As understood from the specification and drawings, the overhead vapor product is interpreted as the vapor stream exiting the overhead drum. It is explained that said second heat exchanger 20 is implemented to raise the temperature of said liquefied natural gas stream to approximately its bubble point temperature (column 4, lines 67-71), which is understood to mean the point where said liquefied natural gas becomes vapor. Marshall, Jr., however, fails to disclose that said second heat exchanger 20 is configured to exchange heat between said first heated liquefied natural gas feed and said overhead vapor product 36, that said second heat exchanger 20 is configured to condense said overhead vapor product 36, or that said system further comprises a compressor configured to compress said overhead vapor product 36 before said overhead vapor product exchanges heat in said second heat exchanger 20. Rhoades et al. teach a related system for processing a liquefied natural gas feed wherein the overhead vapor product 4 from a separator 25 is compressed in a compressor 29 and condensed in a heat exchanger 21 through heat exchange with said liquefied natural gas 2 (see column 3). As with Marshall, Jr., Rhoades et al. teach that said heat exchanger 21 is configured to raise the temperature of said liquid natural gas to the point where it vaporizes

(column 3, lines 14-16). Accordingly it would have been obvious to one of ordinary skill in the art at the time the invention was made, given the teachings of Rhoades et al., to have modified the system disclosed by Marshall, Jr. to include a compressor to compress said overhead vapor product 36, and to have subsequently used said compressed overhead vapor product as the heating medium in said second heat exchanger 20 because Rhoades et al. demonstrate that in such a configuration the compressed overhead vapor product would be sufficient to warm the liquefied natural gas stream to its vaporization point, withdrawing the need for the additional heating medium 48. It is understood that said overhead vapor product would be condensed by said second heat exchanger 20 in this combination since Rhoades et al. teach that the heat exchange between the liquefied natural gas stream 2 and the compressed overhead vapor product 11 causes the latter to be liquefied (column 3, lines 59-64). Said condensed overhead vapor product, in this combination, could then be stored or transported as is well known in the art, or it could be reheated through the heat exchange-expander system 38, 40, 42, 44, 46 already in use by Marshall, Jr.

10. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over US 2952984 (Marshall, Jr.) in view of US 5359856 (Rhoades et al.) as applied to claim 3 above, and further in view of US 3446029 (Grgurich et al.). The combination of Marshall, Jr. and Rhoades et al. demonstrate every limitation of the claim, except for demonstrating a pump configured to pressurize said condensed overhead vapor product. The use of pumps is old and well-known in the art. An example is taught by Grgurich et al. who use a pump 94 to increase the pressure of an overhead product

stream 92 to a desired pressure (column 4, lines 60-71). It would have been obvious to one of ordinary skill in the art at the time the invention was made to have included a pump configured to pressurize the condensed overhead vapor product, as demonstrated by Grgurich et al., in the combination of Rhoades et al. and Marshall, Jr. because such a pump could be used to supply the needed pressure to transport said product stream.

11. Claims 8 and 10-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 5359856 (Rhoades et al.) in view of US 2952984 (Marshall, Jr.). Rhoades et al. disclose a system for separating a liquefied natural gas stream into a methane-rich product and an ethane-rich product, said system comprising a separator 25 configured to fractionate said liquefied natural gas stream 1 into a methane-rich product stream 4 and an ethane-rich product stream 5, a compressor 29 configured to compress said methane-rich product, and a condenser (heat-exchanger) 21 configured to substantially condense said methane-rich product against said liquefied natural gas after compression in compressor 29. Rhoades et al. fail to disclose that a distillation column is used to fractionate said liquefied natural gas stream into said methane-rich product stream and said ethane-rich product stream, that said system further comprises a first heat exchanger configured to exchange heat between said liquefied natural gas with an overhead vapor produced by said distillation column, and that said first heat exchanger is configured to exchange heat from said overhead vapor with said liquefied natural gas stream before said liquefied natural gas stream is heated by any other heat exchanger. Marshall, Jr. teaches a related system for processing liquefied natural gas comprising a



distillation column (tower) 16 that is configured to fractionate a liquefied natural gas stream 14 into a methane-rich product and an ethane-rich product (refer to compositions given in column 3), wherein said column 16 produces an overhead vapor stream 30 that is heat exchanged with said liquefied natural gas stream 14 in a first heat exchanger 18, said first heat exchanger 18 being configured to exchange heat from said overhead vapor 30 with said liquefied natural gas stream 14 before said liquefied natural gas stream is heated by any other heat exchanger (see Figure). It would have been obvious to one of ordinary skill in the art at the time the invention was made to have used the column taught by Marshall, Jr. in place of the separator in the system disclosed by Rhoades et al. because the column can separate out a greater amount of methane (compare composition data in column 3 of Marshall, Jr. with composition data from Table II of Rhoades et al.), and it would have been obvious to have included the first heat exchanger taught by Marshall, Jr. in the system disclosed by Rhoades et al. because Marshall, Jr. explicitly indicates that said heat exchanger enhances the subsequent fractionation of the liquefied natural gas (column 3, lines 66-68).

12. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over US 5359856 (Rhoades et al.) in view of US 2952984 (Marshall, Jr.) as applied to claim 8 above, and further in view of US 3446029 (Grgurich et al.). As described above, the combination of Rhoades et al. and Marshall, Jr. demonstrates all the limitations of the claim, except for a pump configured to pressurize said methane-rich product to a desired pressure. The use of pumps is old and well-known in the art. An example is taught by Grgurich et al. who use a pump 94 to increase the pressure of a methane-rich

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product stream 92 to a desired pressure (column 4, lines 60-71). It would have been obvious to one of ordinary skill in the art at the time the invention was made to have included a pump configured to pressurize the methane-rich product, as demonstrated by Grgurich et al., in the combination of Rhoades et al. and Marshall, Jr. because such a pump could be used to supply the needed pressure to transport said product stream.

13. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over US 5359856 (Rhoades et al.) in view of US 2952984 (Marshall, Jr.) as applied to claim 12 above, and further in view of US 5114451 (Rambo et al.). As described above, the combination of Rhoades et al. and Marshall, Jr. demonstrates all the limitations of the claim, except for a second heat exchanger configured to exchange heat from said ethane-rich product with said liquefied natural gas stream. Rambo et al. teach a related system for processing liquefied natural gas wherein the ethane-rich (C2) product stream 32 from a distillation column 15 is brought into heat exchange with a liquefied natural gas stream 28 in a heat exchanger 13 (column 2, lines 17-34). It would have been obvious to one of ordinary skill in the art to have further included in the combination of Rhoades et al. and Marshall, Jr. a heat exchanger configured to exchange heat from said ethane-rich product stream and said liquefied natural gas stream because Rambo et al. teach that doing so would allow for a means to heat said liquefied natural gas stream which, as already discussed above, would enhance subsequent fractionation. Additionally, such a heat exchanger would sufficiently cool the ethane-rich product stream to maintain it in liquid form, which may be beneficial for transport or storage.

14. Claims 15-18 and 21-26 rejected under 35 U.S.C. 103(a) as being unpatentable over US 5114451 (Rambo et al.) in view of US 5359856 (Rhoades et al.).

Regarding claims 15-18, Rambo et al. disclose a method for recovering ethane and heavier components from liquefied natural gas, the method comprising the steps of preheating said liquefied natural gas in heat exchangers 13 and 41, fractionating said liquefied natural gas into a methane-rich product 34 and an ethane-rich product 32 in a column 15, compressing said methane-rich product in a compressor 17, wherein fractionating comprises producing an overhead vapor 52 which exchanges heat with said liquefied natural gas in heat exchanger 41, and wherein heat is exchanged from said ethane-rich product 32 with said liquefied natural gas in heat exchanger 13.

Rambo et al. fail to disclose that said methane-rich product 34 is substantially condensed, or that said methane-rich product 34 is heat exchanged with said liquefied natural gas after compression of said methane-rich product 34. Rhoades et al. teach a related process wherein the methane-rich product 4 from a separator 25 is compressed in a compressor 29 and condensed in a heat exchanger 21 through heat exchange with a stream of liquefied natural gas 2 (column 3). It would have been obvious to one of ordinary skill in the art to have modified the process disclosed by Rambo et al. to have included a heat exchanger to exchange heat between the liquefied natural gas stream and the compressed overhead vapor product stream 35 to condense said overhead vapor product in the manner taught by Rhoades et al. because the liquefaction of said methane-rich product would be beneficial for the purpose of storage, for example in case said product is not immediately needed for distribution.

Regarding claims 21-26, Rambo et al. disclose a process for preheating liquefied natural gas for feed to a distillation column 15, wherein said distillation column produces an overhead vapor 52, an overhead product 34, and a bottoms product 32, the method comprising the steps of exchanging heat from said overhead vapor 52 with said liquefied natural gas in a heat exchanger 41 such that said overhead vapor is condensed (column 2, lines 40-48), exchanging heat from said bottoms product 32 with said liquefied natural gas in a heat exchanger 13 (column 2, lines 17-34), and further comprises compressing said overhead product 34 in a compressor 17. Rambo et al. fail to disclose exchanging heat from said overhead vapor product 34 with said liquefied natural gas such that substantially all of said overhead vapor product is condensed. Rhoades et al. teach a related process wherein the overhead vapor product 4 from a separator 25 is compressed in a compressor 29 and condensed in a heat exchanger 21 through heat exchange with a stream of liquefied natural gas 2 (column 3). It would have been obvious to one of ordinary skill in the art to have modified the process disclosed by Rambo et al. to have included a heat exchanger to exchange heat between the liquefied natural gas stream and the compressed overhead vapor product stream 35 to condense said overhead vapor product in the manner taught by Rhoades et al. because the liquefaction of said overhead vapor product would be beneficial for the purpose of storage, for example in case said product is not immediately needed for distribution.

15. Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over US 5114451 (Rambo et al.) in view of US 5359856 (Rhoades et al.) as applied to claim 16

above, and further in view of US 3446029 (Grgurich et al.). The combination of Rambo et al. and Rhoades et al. demonstrates all the limitations of the claim except for pumping said methane-rich product as a liquid. The use of pumps is old and well-known in the art. An example is taught by Grgurich et al. who use a pump 94 to increase the pressure of a liquid product stream 92 to a desired pressure (column 4, lines 60-71). It would have been obvious to one of ordinary skill in the art at the time the invention was made to have included a pump configured to pressurize the condensed methane-rich product, as demonstrated by Grgurich et al., in the combination of Rambo et al. and Rhoades et al. because such a pump could be used to supply the needed pressure to transport said product stream.

***Allowable Subject Matter***

16. Claims 5-7, 14 and 19 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims and rewritten to overcome the any rejection(s) under 35 U.S.C. 112 set forth in this Office action.

***Conclusion***

17. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

US 3420068 (Petit): discloses a system for LNG comprising a series of heat exchangers used to heat said LNG.

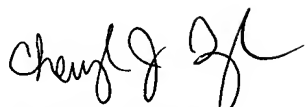
US 3837821 (Buffiere et al.): discloses a system for LNG comprising a series of initial heat exchangers.

18. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Richard L. Leung whose telephone number is 571-272-4811. The examiner can normally be reached on Mon-Fri.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Cheryl J. Tyler can be reached on 571-272-4834. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Richard L. Leung  
Examiner  
Art Unit 3744

  
**CHERYL TYLER**  
**SUPERVISORY PATENT EXAMINER**

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